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SOURCE Za Ekonomiyu Topliva, No 8, 1951.USSR GASIFIES TAILINGS

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Large quantities of tailings are carried to the dumps on the grounds of coal-cleaning plants and coal-preparation shops of coke by-products plants in the USSR. These contain up to 30-35 percent of combustible matter and may be regarded with interest as low-grade local fuel. Experiments have indicated that they may be used both for combustion and gasification purposes.

The chief difficulty in gasifying tailings is their tendency to cake, which makes constant poking and increased blast pressure necessary. Experiments have shown the effectiveness of gasifying tailings mixed with coke siftings, also a waste product of the coke by-products industry. A mixture consisting of 80-percent tailings and 20-percent coke siftings has given good results. Difficulties arising from slag formation are considerably reduced if 1-2 percent lime is added.

Experiments in gasification were conducted in an industrial gas generator with rotating grates. The gas generator was 2.6 meters in diameter, 2.5 meters high, and operated on the air-steam blast principle. The components of the tailings used for the experiments were as follows: carbon, 28.1 percent; hydrogen, 2.6 percent; nitrogen, 1 percent; oxygen, 1.1 percent; sulfur, 5.63 percent; moisture, 5.8 percent; and ash, 53.77 percent.

The tailings varied in size as follows: 0-1 millimeter, 8 percent; 1-12 millimeters, 60 percent; and 12 millimeters, 32 percent. The ash from the tailings contained a mixture of noncombustible minerals averaging about as follows: silicon dioxide, 45 percent; aluminum trioxide, 20 percent; ferric oxide, 27 percent; calcium oxide, 2.5 percent; magnesium oxide, 1.5 percent.

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The experiments showed the following results:

1. Despite the considerable ash content and the high percentage of easily fusible substances, the process of slag formation in gasifying tailings mixed with coke siftings does not create difficulties in the utilization of the gas generator. As a result of using the mixed charge and the air-steam blast, the slag is loosened, and normal conditions of slag removal are assured. The addition of 1-2 percent lime creates very favorable circumstances under which the slag becomes porous and separates out easily.
2. The average chemical contents of the gas obtained in gasifying tailings mixed with coke siftings are not inferior to those of gas obtained from gas coal.
3. The average temperature of the gas at the outlet of the gas generator in the case of gasifying tailings mixed with coke siftings is higher than in gasifying gas coal. This is explained in part by the necessity of operating on a lower fuel layer. This lower layer results from the increase in the hydraulic resistance of the layer, brought about by the high content of small pieces and the high specific weight of the tailings. As a result of this, the bulk mass becomes more compact during the charging of the generator. The high temperature in the oxidizing zone may also have influenced the temperature at the outlet of the gas generator. This is the result of the considerable amount of ferric oxide in the ash of the tailings.
4. The carbon content of the slag from the tailings mixture amounts to 3.1 percent, considerably less than that in slag from the gasification of gas coal.

The more complete combustion of carbon in the slag resulting from gasifying tailings with an admixture of coke siftings than in the case of gasifying gas coal can be explained by the ash content of the fuel being gasified, since the temperature and rate of combustion depend on the ash content and, with the increase in temperature and rate of combustion, conditions for burning carbon in the slag are considerably improved. The high content of ferric oxide, with its catalytic action, in the tailings slag also explains the more complete combustion of the carbon from the slag of that type fuel.

5. The performance of a cross section of a gas generator in gasifying tailings with an additive of 20-percent coke siftings was 225 kilograms per square meter per hour, that is, 10-12 percent below modern norms for gas-generator performance in gasifying bituminous coal.

The following conclusions have been drawn from the results of the experiments:

1. Tremendous amounts of tailings obtained in processes of coal cleaning and in coke by-products industry can be considered as local fuel and can be successfully used for gasification in gas generators.
2. Results of a number of experiments indicate that, when the gasification charge consists of 80 percent tailings and 20 percent coke siftings, the content of the gas obtained and its calorific value are not inferior to those of gas derived from gas coal.
3. Although a considerably greater amount of slag is formed in the gasification of tailings, nevertheless the addition of 1-2 percent lime causes the formation of easily loosened slag which can be readily removed. The lime also results in a considerable decrease in the hydrogen-sulfide content of generator gas.
4. The use of tailings as local fuel for gasification in gas generators will result in a great saving of high-grade fuel and will permit a considerable relief to railroad transport.

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